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H. K. JONES.

METAL SCREW MACHINE.

No. 354,603. Patented Dec. 21, 1886.

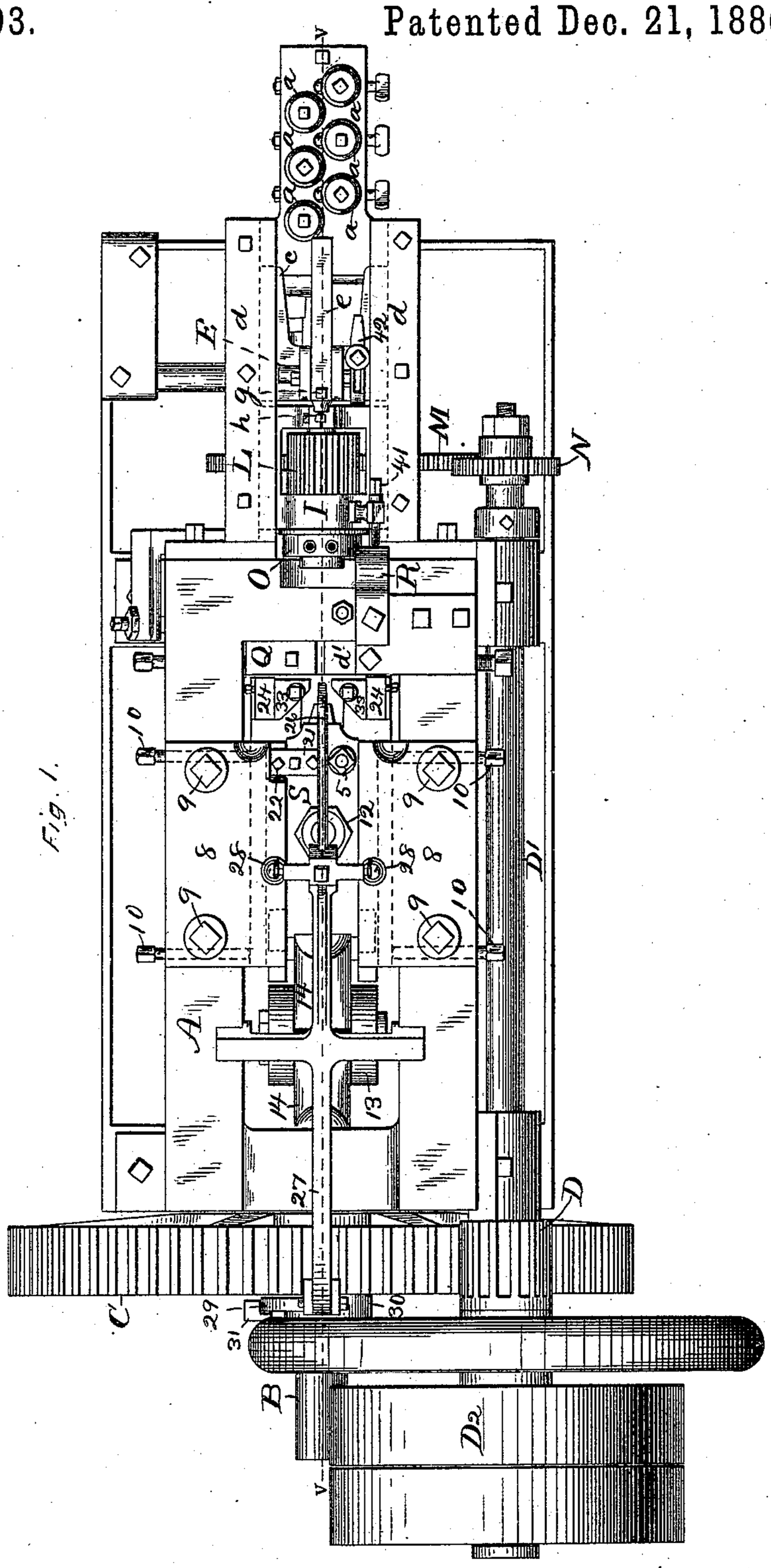

FIG. 1.

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By James Shepard
Atty.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 2.

H. K. JONES.

METAL SCREW MACHINE.

No. 354,603. Patented Dec. 21, 1886.

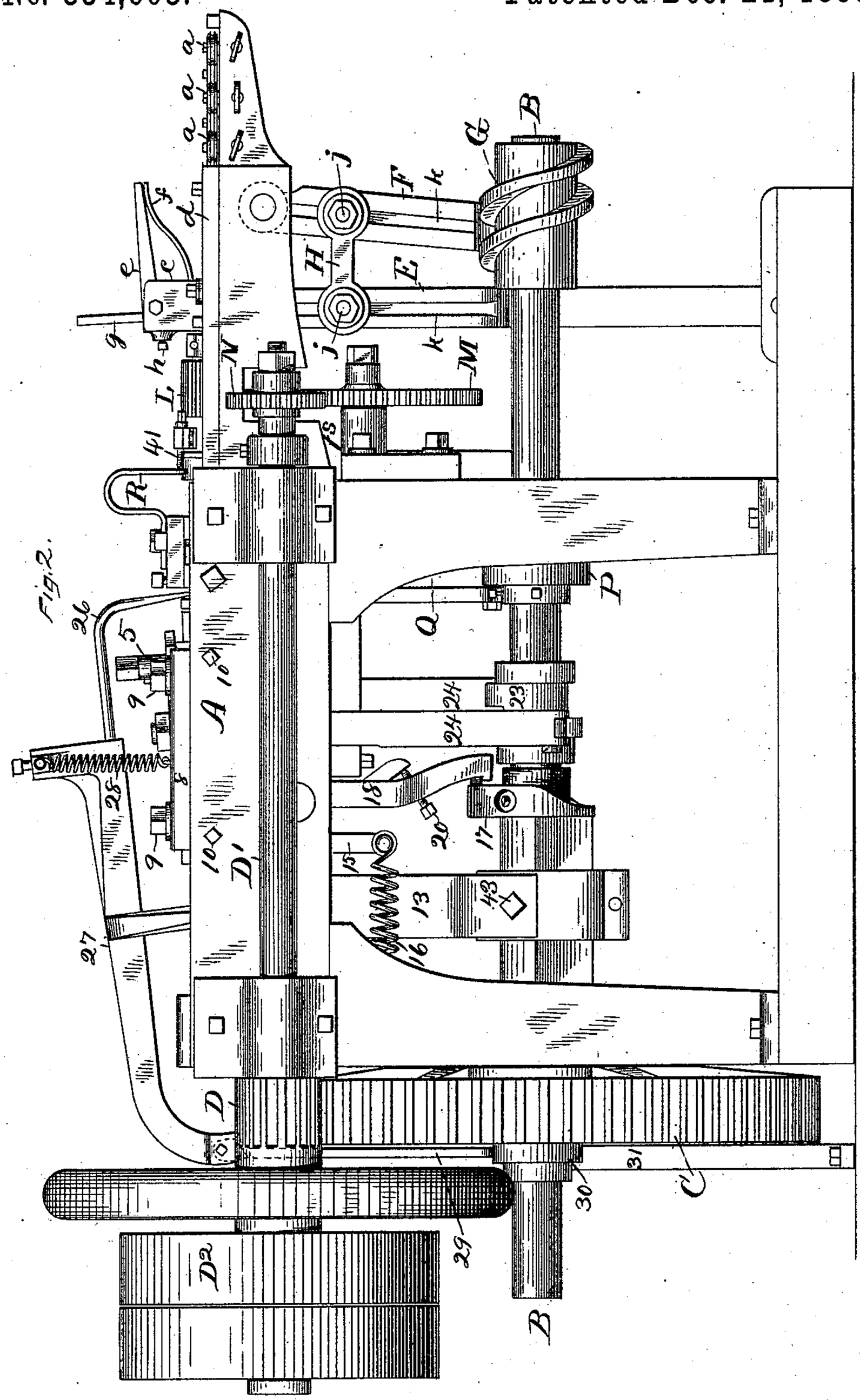

Fig. 2.

Witnesses.
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H. K. JONES.

METAL SCREW MACHINE.

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Fig. 3.

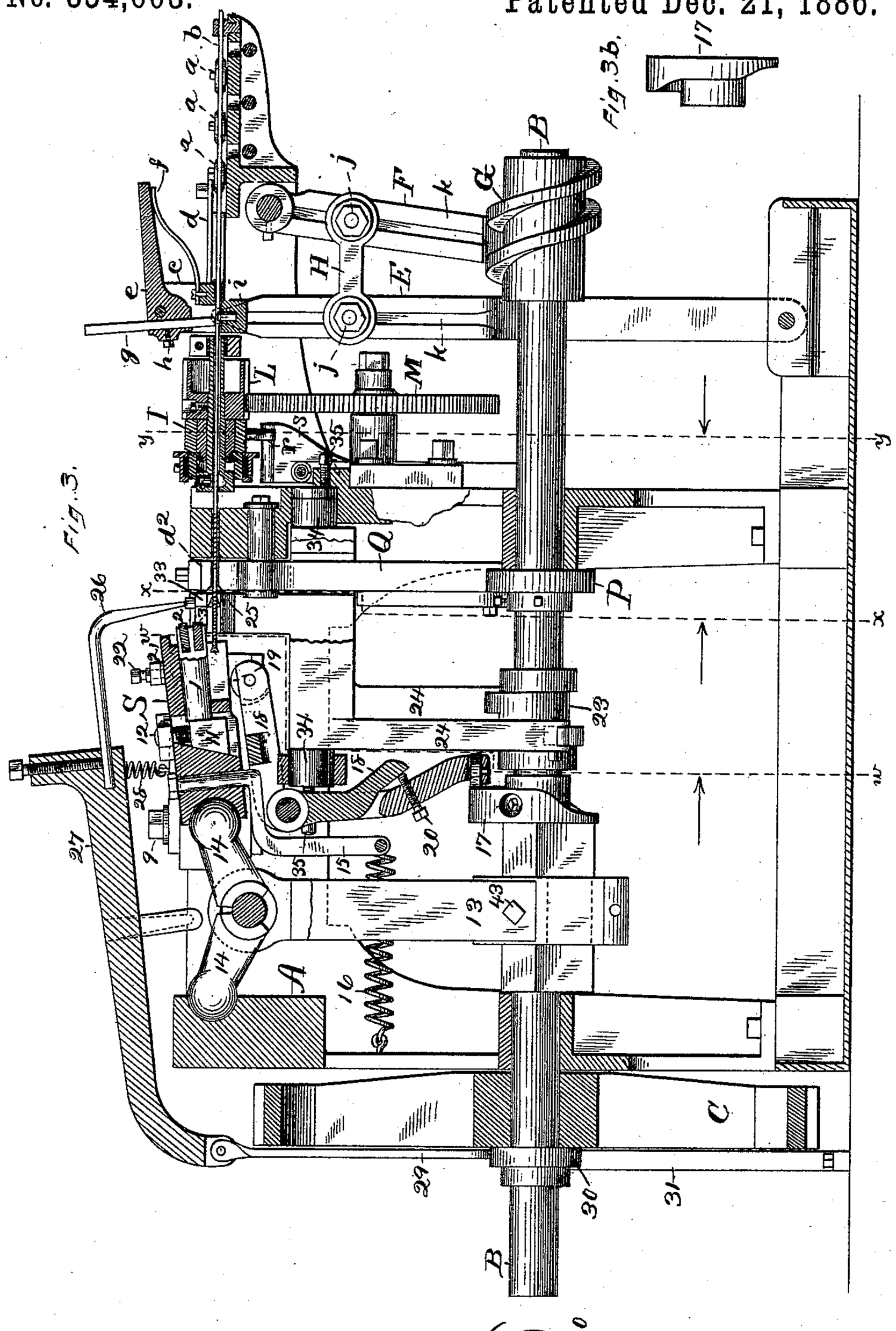
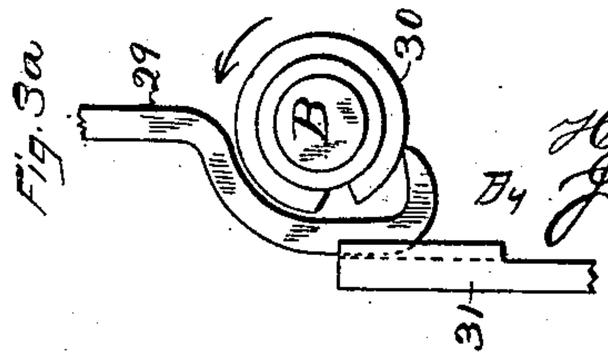


Fig. 3b.

Fig. 3a



Witnesses,
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H. K. JONES.

METAL SCREW MACHINE.

No. 354,603. Patented Dec. 21, 1886.

Fig. 4.

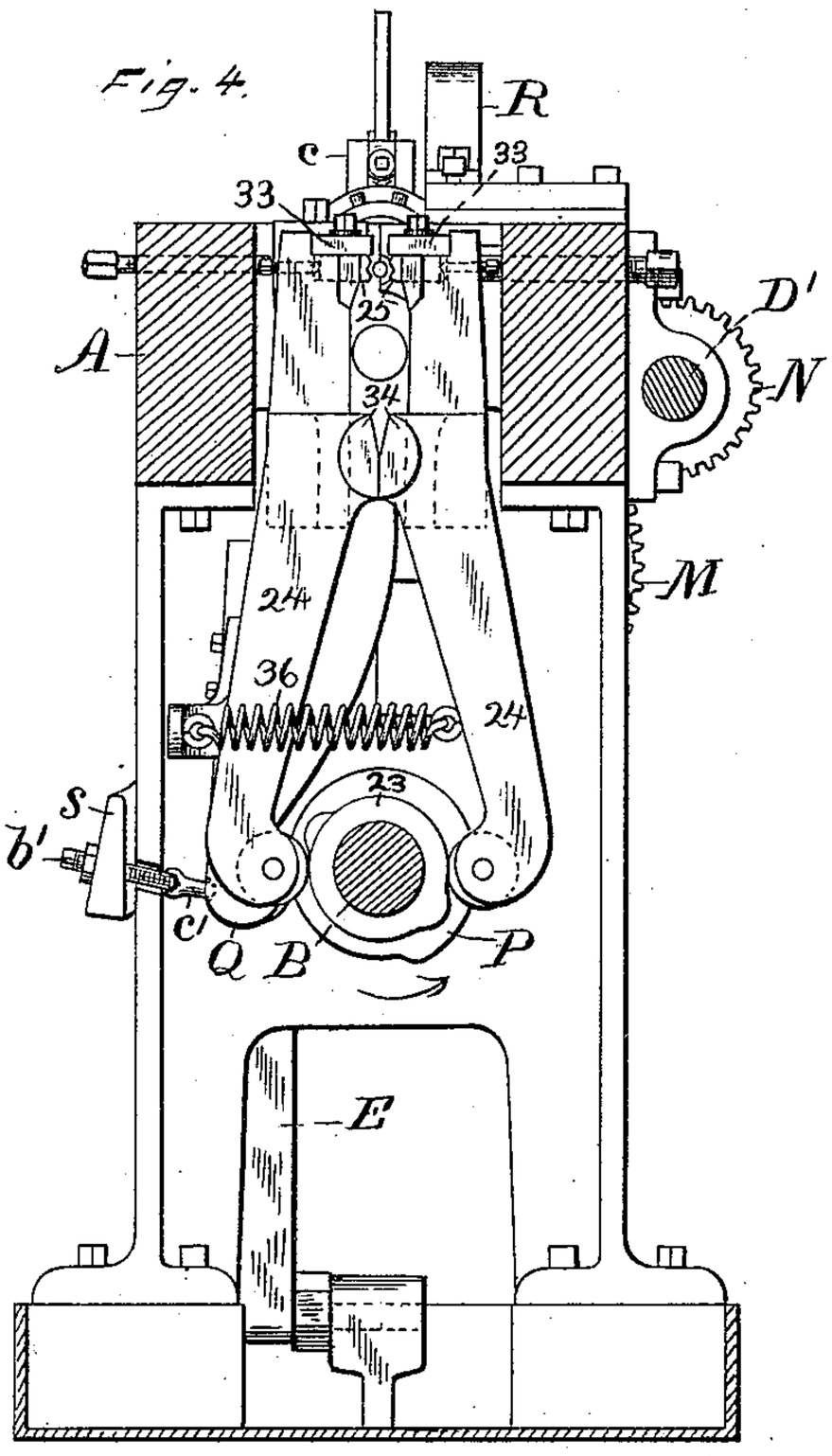


Fig. 5.

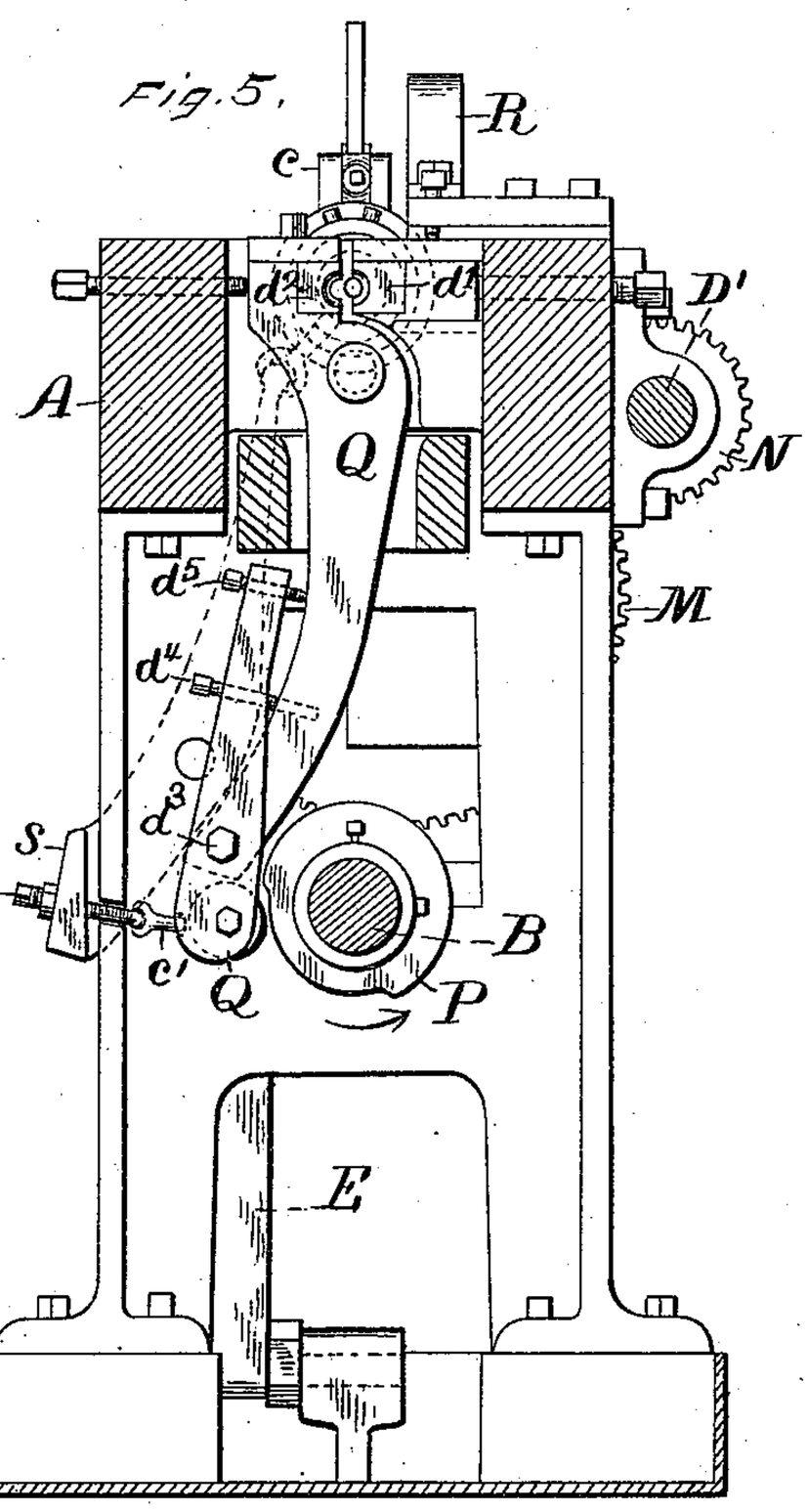


Fig. 6.

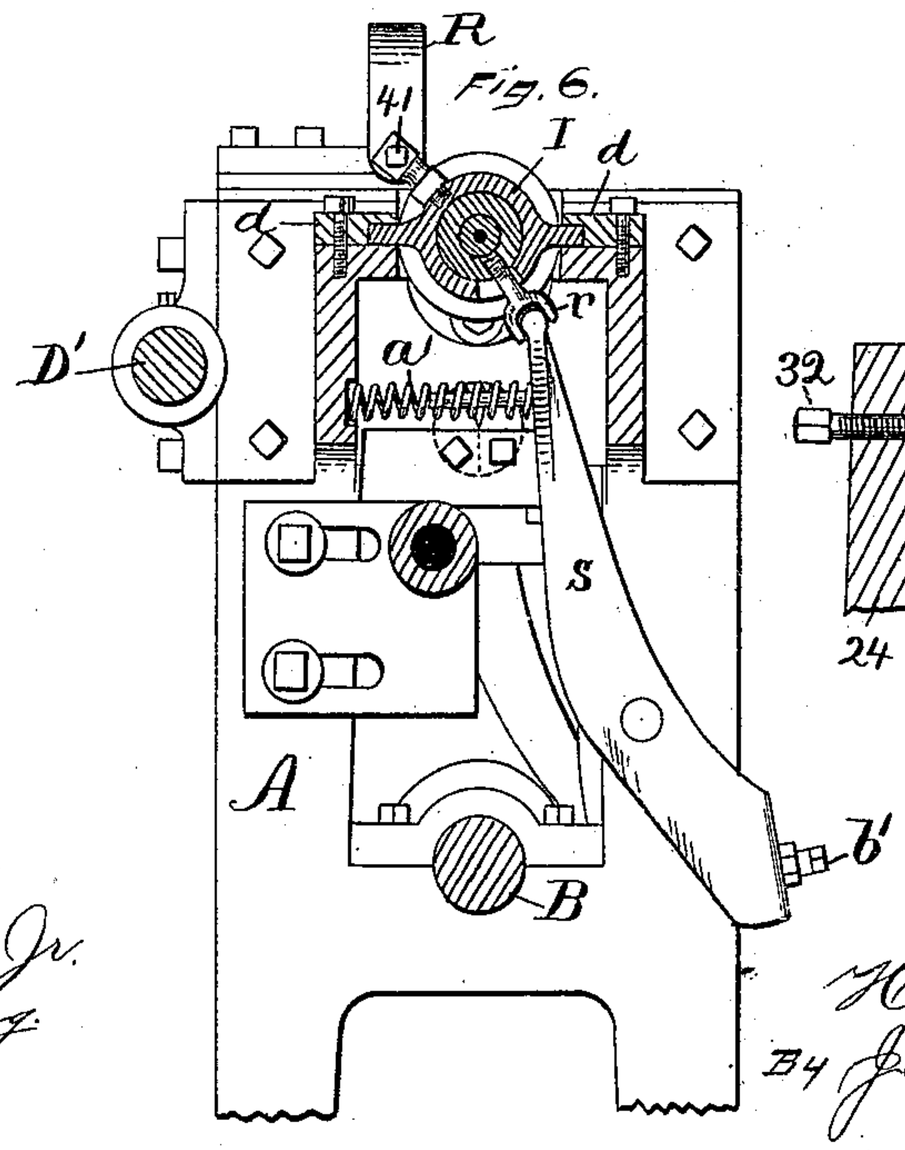
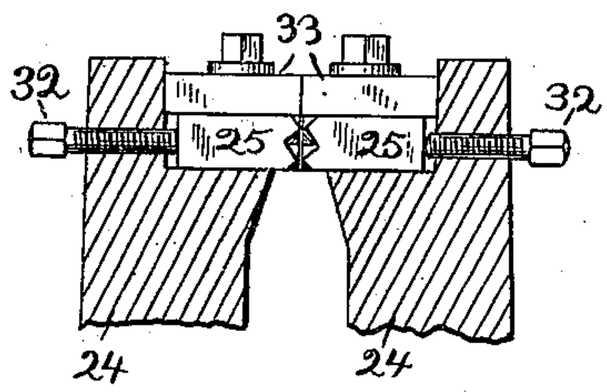


Fig. 7.



Witnesses.
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METAL SCREW MACHINE.

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Fig. 8.

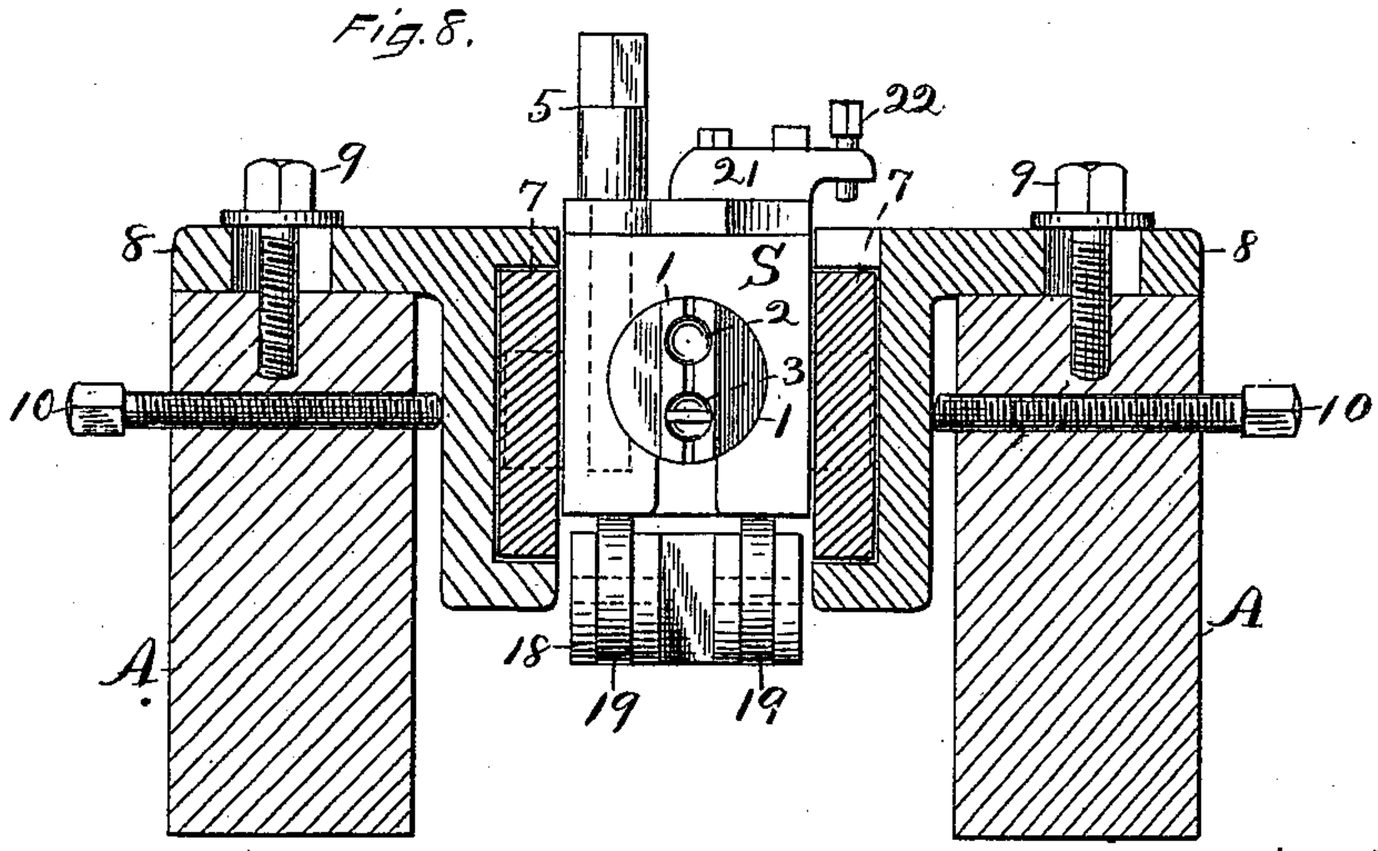

Fig. 9.

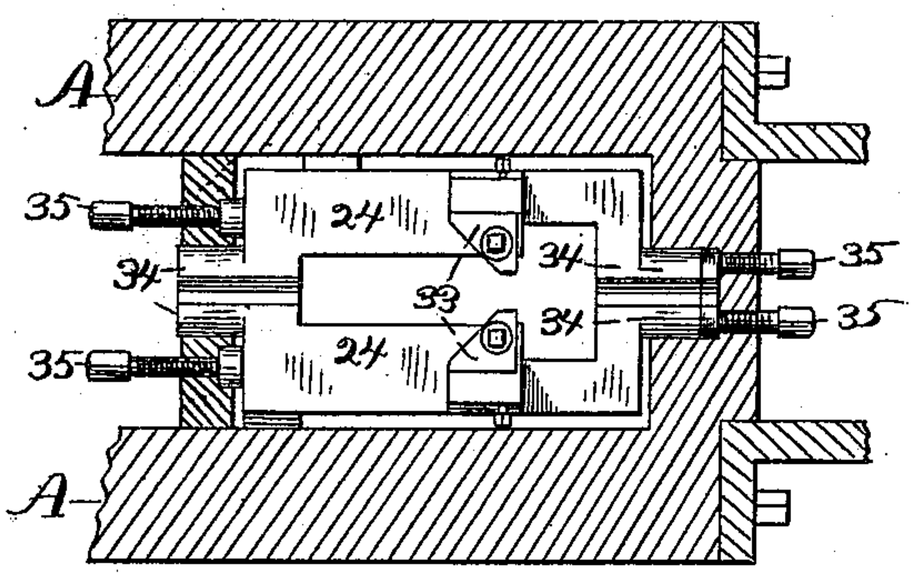

Fig. 10.

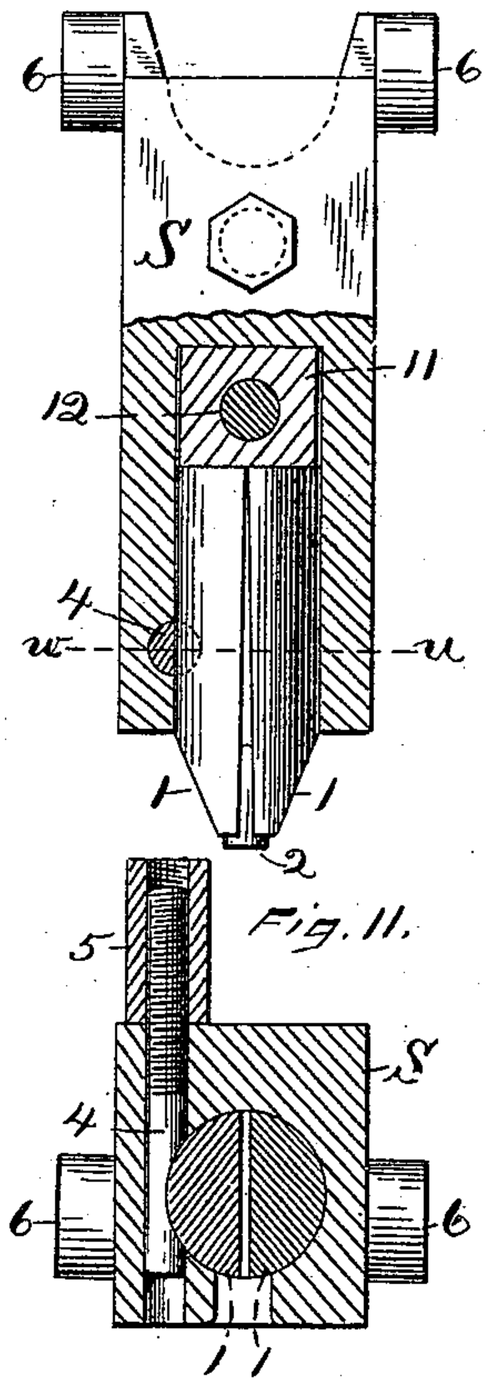

Fig. 11.

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METAL SCREW MACHINE.

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Fig. 12.

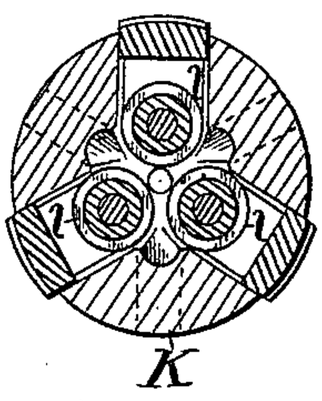


Fig. 13.

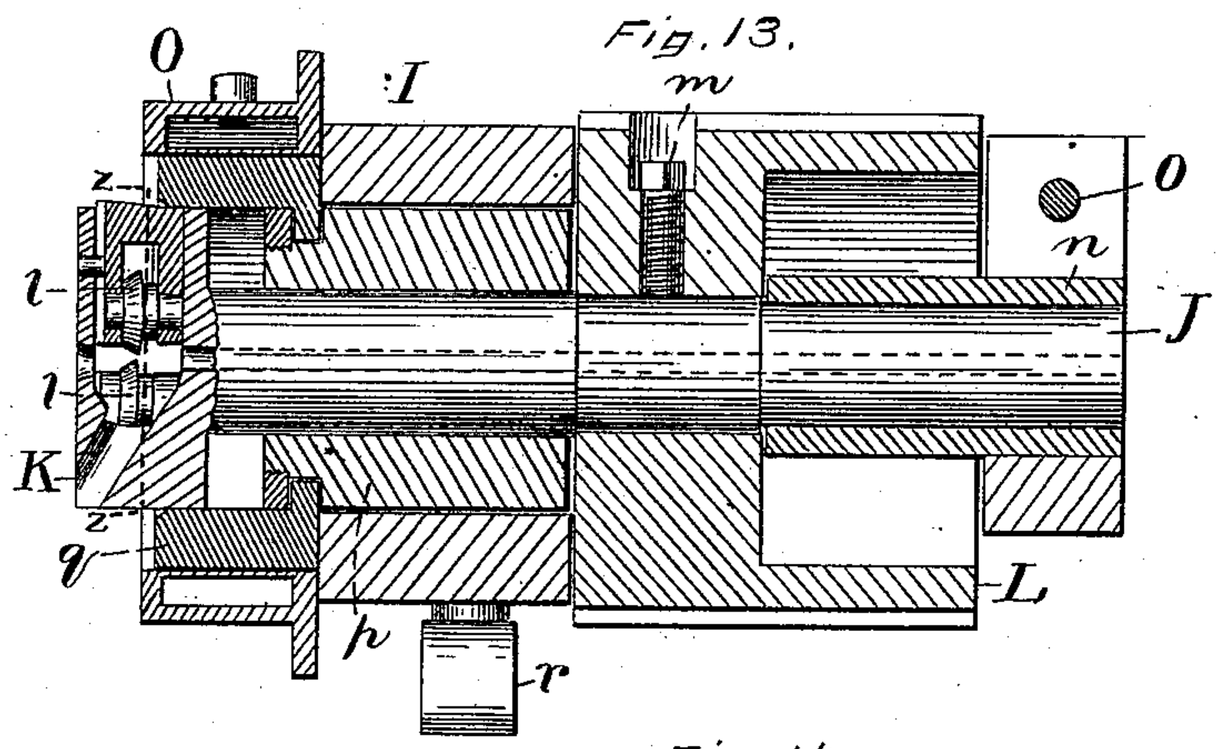


Fig. 14.

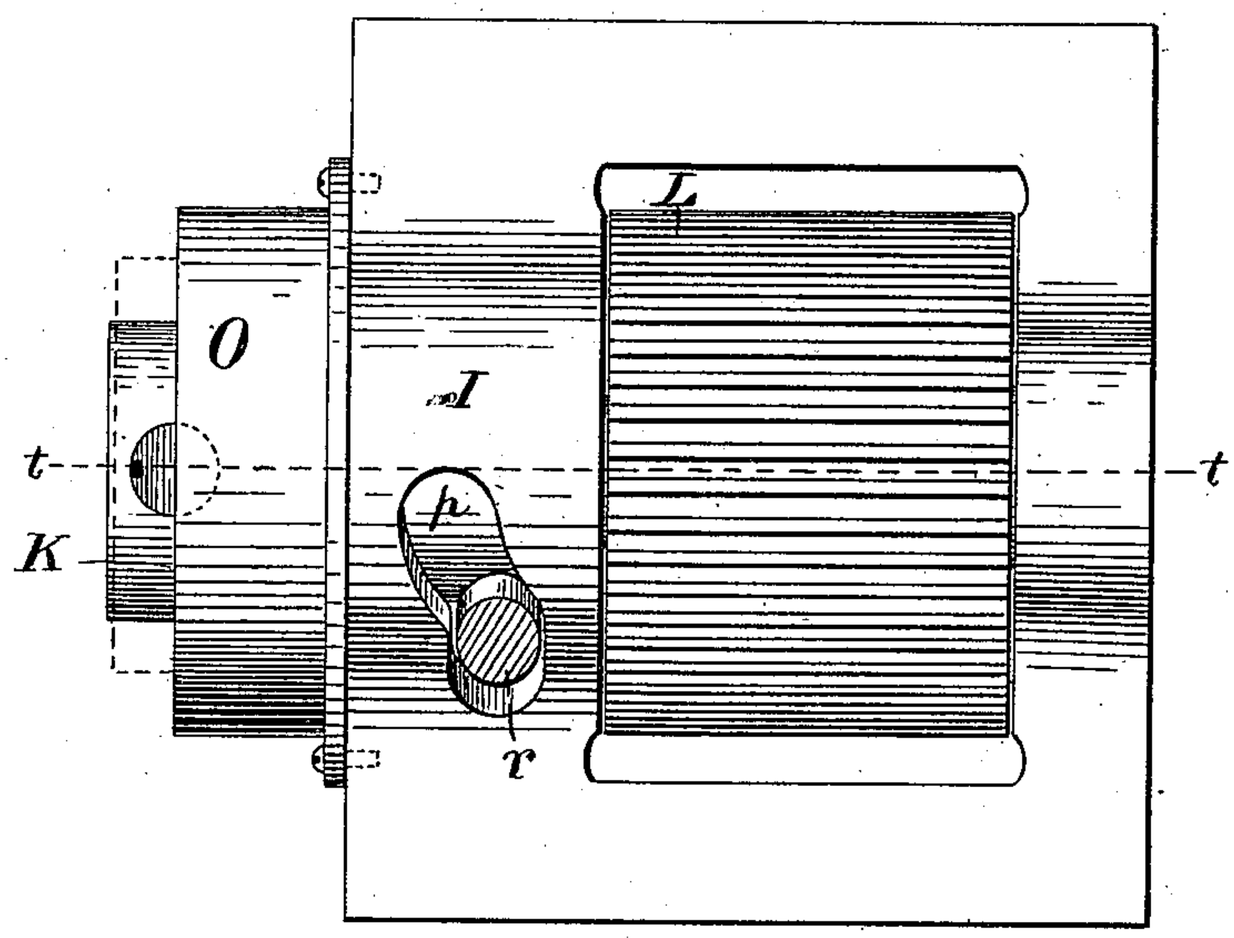


Fig. 16.

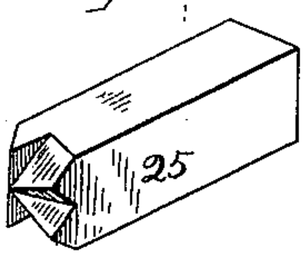
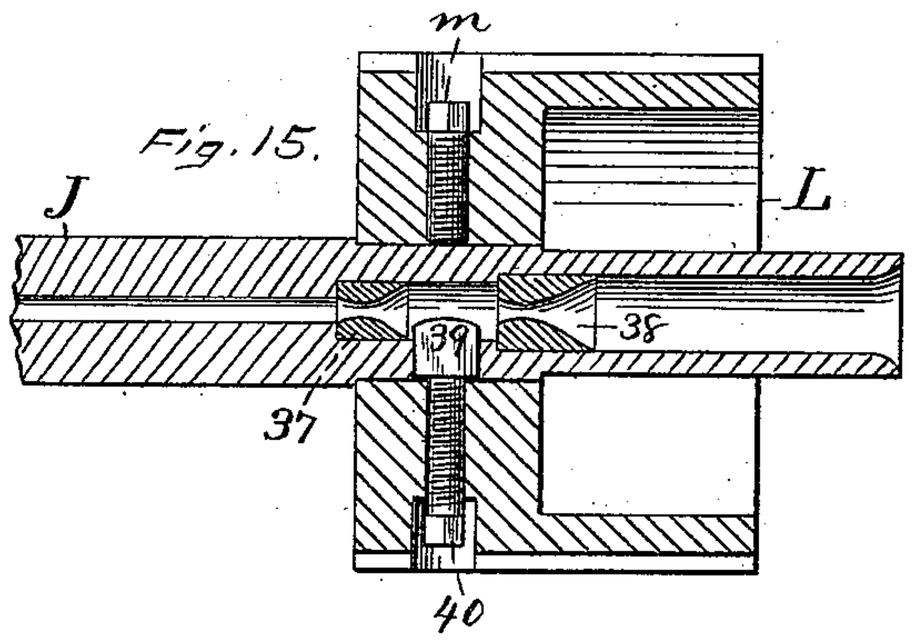


Fig. 15.



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(No Model.) 8 Sheets—Sheet 7.

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METAL SCREW MACHINE.

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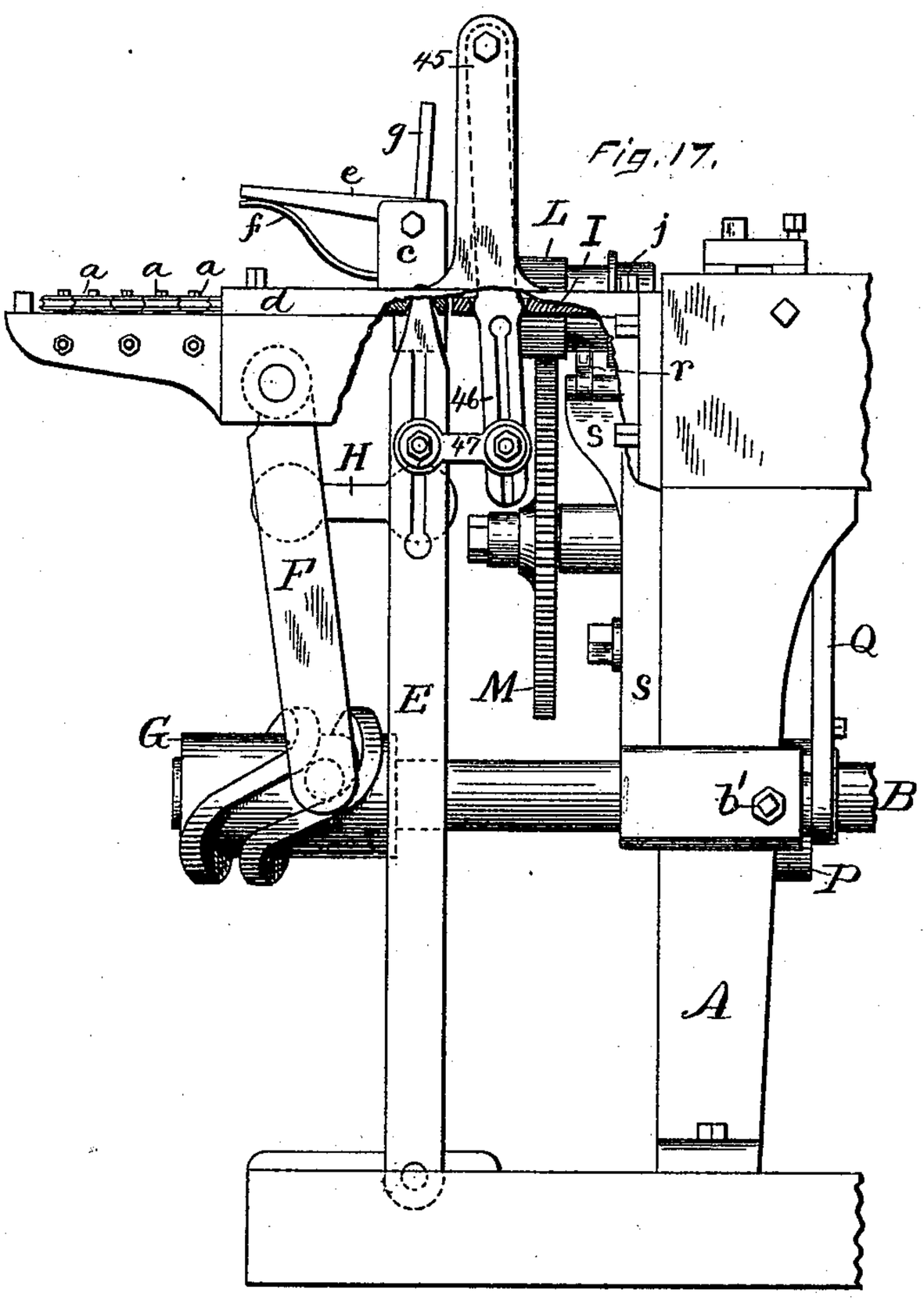
Fig. 17.



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H. K. JONES.

METAL SCREW MACHINE.

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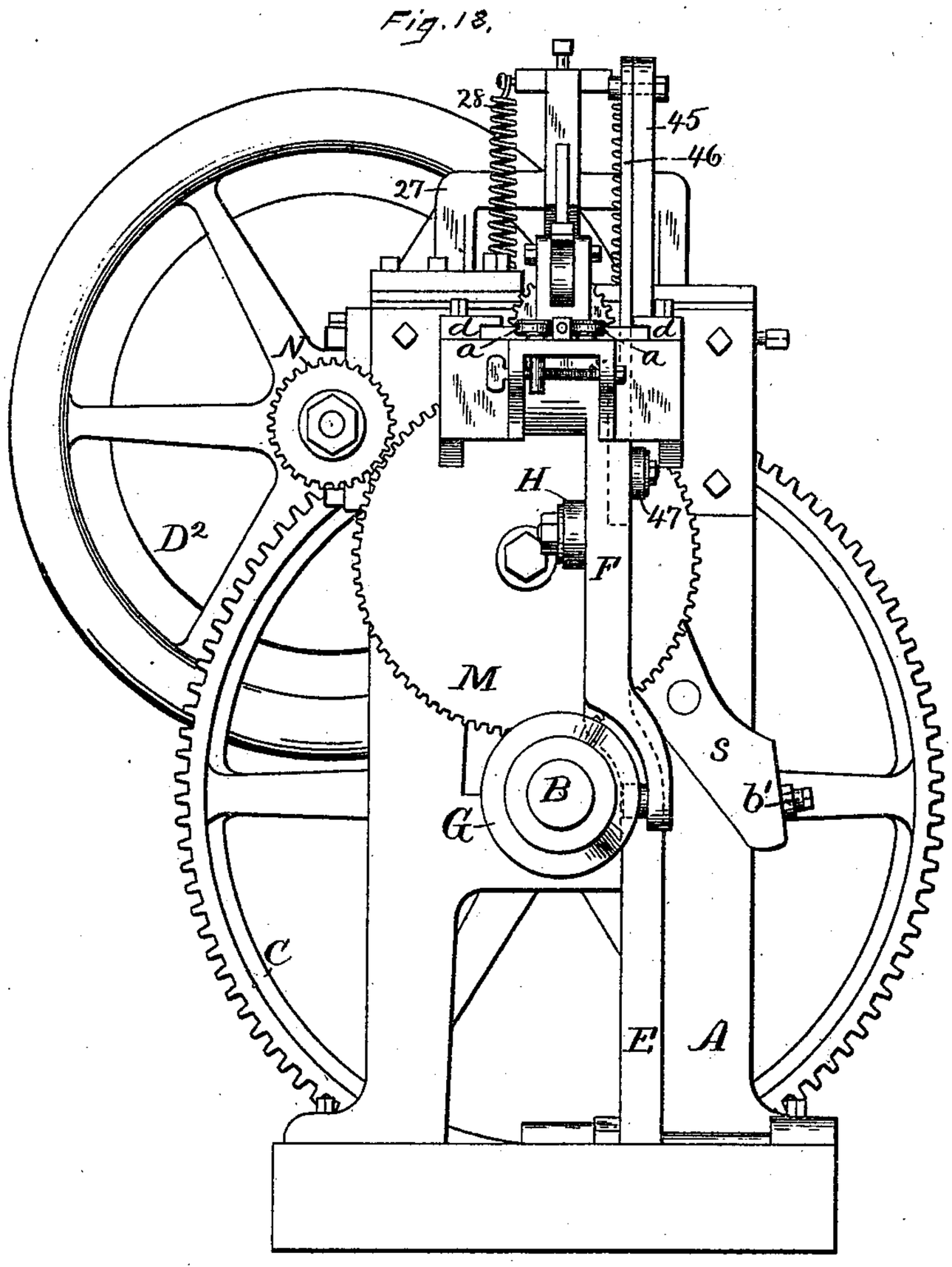
Fig. 18.



Witnesses,
John Edwards Jr.
Milton H Bassett.

Inventor.
Horace K. Jones.
By James Shepard
Atty

UNITED STATES PATENT OFFICE.

HORACE K. JONES, OF HARTFORD, ASSIGNOR TO THE RUSSELL & ERWIN MANUFACTURING COMPANY, OF NEW BRITAIN, CONNECTICUT.

METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 354,603, dated December 21, 1886.

Application filed July 28, 1886. Serial No. 209,277. (No model.)

To all whom it may concern:

Be it known that I, HORACE K. JONES, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Screws, of which the following is a specification.

My invention relates to improvements in machines for making screws, but the machine as a whole is so entirely different from other screw-making machines that it can hardly be said to belong to any particular class of screw-machines as heretofore made. Some of the parts are, however, applicable to screw-making machinery, and also to machinery for making wire nails.

The objects of my improvement are, first, the production of a machine which will automatically produce finished screws directly from an indefinite length of wire, and, second, to improve the efficiency and construction of many of the parts of machinery used in making screws or nails.

In the accompanying drawings, Figure 1 is a plan view of my machine for making screws. Fig. 2 is a side elevation thereof. Fig. 3 is a longitudinal section on line *v v* of Fig. 1, with some of the parts in elevation. Fig. 3ª is a side elevation of detached parts, showing particularly the cam and shaft at the rear end of the machine. Fig. 3ᵇ is a side elevation of the cam 17 as viewed from the opposite side from that illustrated in Fig. 3. Fig. 4 is a transverse section of said machine on line *w w* of Fig. 3, looking in the direction indicated by the dart nearest said line. Fig. 5 is a similar section on the line *x x* of Fig. 3, looking in the same direction. Fig. 6 is a like section, partly in elevation, on line *y y* of Fig. 3, looking in the opposite direction, as indicated by the dart near said line. Fig. 7 is an enlarged view showing in section the upper ends of the jaws which carry the cutters for severing and pointing the wire, together with a side elevation of said cutters and connected parts. Fig. 8 is a partial vertical sectional view of the framing, showing also the face of the heading-ram and the mode of adjusting said ram laterally. Fig. 9 is a horizontal sectional view of a portion of the frame, together with a plan view of the levers which carry the cutters for severing and pointing the wire, showing the manner of adjusting said cutters in the longitudinal direction of the machine. Fig. 10 shows the heading-ram partly in plan view and partly in horizontal section. Fig. 11 is a transverse section of the same on line *u u* of Fig. 10, the clamping-bolt being in elevation. Fig. 12 is a transverse section of the threader on line *z z* of Fig. 13, looking toward the left. Fig. 13 is a vertical section of the threader on line *t t* of Fig. 14. Fig. 14 is a reverse plan view of the threader, the operating-fork being shown in section. Fig. 15 is a longitudinal section of a modified form of a threader-shaft, so that it may also form a revolving wire-straightener. Fig. 16 is a perspective view of one of the tools used for cutting off the wire and pointing the screws. Fig. 17 is an elevation, partly in section, of one end of my machine somewhat modified, the same being viewed from the opposite side from that shown in Fig. 2; and Fig. 18 is an elevation of the same, looking at the front end. Figs. 7 to 16, inclusive, are on a larger scale than the other figures.

A designates the framing of the machine, and B the main shaft, which extends lengthwise with the machine and carries the several cams for operating the various parts. As illustrated herein, this shaft is driven by the larger gear-wheel, C, mounted thereon, which meshes into the pinion D on the shaft D′, which is driven by means of a belt applied to the pulley D².

The terms "forward" and "backward," as herein used, are applied to designate the relative position and movements of the parts with reference to the front end of the machine. The right-hand end of the machine, as shown in Figs. 1, 2, and 3, is considered as said front end.

At the front end of the machine there is a series of rollers, *a*, between which rollers the wire *b*, Fig. 3, passes as it is fed to the machine, said rollers being those of ordinary straightening devices, such as are used in nail-machines. Immediately adjoining the rollers *a* is the feed-carriage, which reciprocates in suit-

able ways, as indicated by the broken lines in Fig. 1, said ways being partially formed in the cap-plates *d d*. This feeding-carriage consists of a slide, *c*, angle-lever *e*, spring *f*, bar *g*, set-screw *h*, and grooved block *i*, Fig. 3. This feeding mechanism, thus specified, is old, and other feeding mechanism may be substituted therefor. The feeding carriage or slide is reciprocated by means of the levers E F and cam G on main shaft B, the lower end of the lever F having a pin (indicated by broken circle in Fig. 17) which engages with the groove of the cam G. The upper end of the lever F is fulcrumed to the frame of the machine, and the lever E is fulcrumed at its lower end to a part of the frame, while its upper end engages an opening at one side of the slide *c*, as shown in Fig. 1, and as indicated by broken lines in Fig. 3. These levers E and F are connected by a link, H, Figs. 2 and 3, which link is secured by means of bolts *j*, whose heads rest within grooves *k*, having overhanging side walls in said levers. The throw of the feed-carriage is adjusted by loosening the nuts on the bolts *j* and moving the link H up or down upon the levers E F and then securing the link in position to give the desired length of motion to the feed-carrier.

The plates *d* and the ways for the feed carriage are made long enough to accommodate said carriage, and also the threader which reciprocates in the opposite end of the same ways. This threader will be best understood by reference to Figs. 12, 13, and 14, where it is shown on a larger scale and detached from the machine. I designates the frame of this threader, within which is fitted a hollow spindle, J, upon the rear end of which is an enlargement or head, K, containing three radially-sliding blocks bearing threading dies or tools, preferably in the form of rollers *l*, which roll or swage the thread on the rod, the form of the rollers being adapted to the thread desired. In the present illustration these rollers are adapted for forming what is known as a "ratchet-thread." The axis of the threading-rollers is set at an inclination to the axis of the spindle corresponding to the pitch of the thread to be produced. Such rollers for forming a screw-thread of themselves are not of my invention, but I mount said rollers in radially-moving slides or blocks for the purpose of forming the thread over a short portion only of a wire and then withdrawing the rollers, so that the threader may be returned and thread another portion of the wire, one plain portion and the adjoining threaded portion of the wire together being used for the making of a single screw. The spindle J, carrying the head K and threading-rollers, is driven by means of pinion L, which meshes into the gear-wheel M, mounted on the frame, which wheel M is driven by pinion N on the shaft D'.

When the back gear on the shaft D' is omitted and the driving-belt passes directly to a pulley on the main shaft B, then the threader will be driven by a gear-wheel on the main shaft B and suitable intermediate gearing to engage pinion L. This pinion is made wide in the longitudinal direction of the machine, so as to permit a reciprocating movement of the threader without disengaging said pinion from the driving-gear. This pinion L is secured to the hollow spindle by means of the set-screw *m*, Fig. 13. The hub of pinion L, being placed between the threader-frame I and the bushing *n*, acts as a collar to prevent endwise movement of the spindle J within the frame I. The front end of the frame I is slit at the upper side and provided with a clamp-bolt, *o*, for the purpose of fastening said bushing in the desired position. Within the front portion of the frame and loosely fitted to the spindle J is a collar, *p*, to the rear end of which collar is secured a ring or sleeve, *q*, Fig. 13, which fits over the head K. The outer ends of the sliding blocks in which the threading-rollers *l* are placed are beveled slightly, as shown, so that when the sleeve *q* is pushed out over the head K the threading-rollers *l* are forced radially inward, and when the sleeve is drawn back these rollers are permitted to move outward into the position shown in Figs. 12 and 13. The parts are so assembled that in operation the sleeve can never be drawn forward far enough to entirely uncover the radially-sliding blocks; but said sleeve is left so as to partially project over the same, as shown in Fig. 13, and thereby prevent the blocks from dropping entirely from the head. The collar *p* and sleeve *q*, Fig. 13, are reciprocated by means of the forked pin *r*, whose shank rests in an oblique slot in the under side of the threader-frame, as shown in Fig. 14. When this pin is forced to one end of the slot or near it, as shown, the sleeve *q* is forced forward to the extent of its movement, as shown in Fig. 13; but by moving this forked pin to the opposite end of the slot the sleeve *q* is forced rearward over the ends of the radially-sliding blocks bearing the threading-rollers into the position indicated by the broken lines in Fig. 14. Surrounding the sleeve *q* is a water-jacket, O, through which a stream of water may pass to keep the parts cool. This water-jacket is secured to the front end of the frame I in any proper manner—as, for instance, by means of screws, as shown in Fig. 14. In order to avoid crowding I have omitted from Fig. 3 part of the reference-letters pertaining to the threader.

The fork *r*, which reciprocates the sleeve *q*, is operated by means of the lever *s*, which is thrown in one direction by means of a spring, *a'*, Fig. 6, and in the opposite direction by means of the cam P on shaft B and the interposed end of the lever Q, which closes the holding-jaws. At the lower end of the lever *s*, which lever is fulcrumed on an upright of the frame, there is an extension within which is placed the set-screw *b'*, Figs. 4, 5, 6, and 17, the end of which rests in a socket of a toggle-arm, *c'*, the opposite end of which toggle-arm

rests in a socket in the end of lever Q, thereby forming a jointed connection between said levers *s* and Q, which is also adjustable by means of the set-screw *b'*, so as to give the desired throw to the lever *s* for forming the desired depth of thread. The upper end of the lever *s* is quite wide in the lengthwise direction of the machine, as shown in Fig. 3, and is rounded with a cylindrical swell on its upper end, so as to properly engage the forked pin *r*, as shown in Fig. 3, and also in Fig. 6. This widening of the upper end of the lever *s* allows the fork to travel on said lever when the threader-carriage reciprocates.

The head K of the threader is provided with three holes leading from the center outward and rearward, as shown at the lower rear corner in Fig. 13, and as indicated by the three pair of broken lines in Fig. 12, which holes are for the discharge of chips or such small pieces of metal as may be liberated in threading. A spring, R, is secured on the framing of the machine in position for contact with screw 41, which projects from the threader-framer I, as most clearly shown in Figs. 1 and 2.

The gripping or holding dies are arranged rearward of the threader, the die d' being stationary, while the movable die d^2 is held in the upper end of the lever Q, which swings upon a stud, as shown in Fig. 5. This lever Q is made in two parts for the purpose of adjusting its stroke, said two parts being pivoted together by the bolt d^3 and held by the bolt d^4, which passes through a threadless hole in the short arm of the lever Q and into a threaded hole in the longer member of the lever Q, and the set-screw d^5, which passes through a threaded hole in the short member of the lever Q and bears against one edge of the long member thereof. By means of these screws the shorter member can be adjusted upon the longer one, so as to regulate the gripping pressure of the holding-dies, and also to rigidly hold the two members of the levers together when adjusted, the same as if the lever Q were formed in a single piece.

The wire *b* is fed by the mechanism before described through the threader and holding-dies. The cam P, operating upon the lower end of the lever Q, closes the holding-dies upon the rod and at the same time moves the lever *s* in the direction to throw the sleeve *q* over the head K and force the threader-rollers inward to act upon the wire. This threader being revolved by means of the pinion L and connected gearing, the inclined position of the threading-rollers as they bite the wire will cause them to travel thereon toward the front end of the machine and draw the threading-carriage with them so long as the rollers are forced against the wire. So soon as the higher concentric face of the cam P passes the end of the lever Q said lever, together with the lever *s*, is released, when the spring *a'*, Fig. 6, throws the lever *s* to its former position, thereby withdrawing the sleeve *q* from over the threading-rollers *l* and permitting them to withdraw from the wire.

The feeding mechanism before described is moving forward when the gripping-dies are holding the rod and the threader is at work threading a portion of the rod and moving forward thereon, but the feeding mechanism moves forward faster than the threader-carriage. As soon as the threader and holding-dies release their hold upon the rod the feeding-slide *c* moves backward again and pushes the wire through the threader and holding-dies. After it has traveled back a distance equal to the length of wire to be left plain between each threaded portion it comes in contact with the threader-frame and pushes said frame back again to take a fresh hold upon the wire. In order to prevent the threader from going backward too far, the spring R is provided, and the set-screw 41 is preferably so adjusted that it comes in contact with said spring a little before the threader has been pushed backward to the end of its stroke. The spring will then assist the threader in starting on its return-stroke when it is beginning to form the thread. In order that the contact of the feeding-carriage with the threader-frame may be adjusted, I provide the feeding-carriage with a slotted extension-piece, 42, Fig. 1, which is secured to the slide *c* by means of a bolt passing through a slot in said extension-piece. The front end of this piece comes in contact with the threader-frame I and moves it backward.

In order to thread a longer or shorter portion of the wire, the gearing which drives the pinion L of the threader may be changed, like the gearing of a screw-cutting engine-lathe, to give the threader a greater or less number of revolutions during the time that the threader-rollers are held in action, and the number of threads to the inch may be governed by changing the inclination of the axes of the rollers.

S designates the heading-ram, which carries two heading-tools, and is given a double stroke. The front end of the ram is bored out longitudinally to receive two semicircular tool-holders, 1 1, which, taken together, have a cylindrical form. Although I have termed them semicircular, their confronting faces are in fact cut off a little toward the front end, so as to leave them slightly open, as shown, and making them a little less than a semicircle at the front. Their outer corners are also cut off on the part which is without the socket in the ram S. The confronting inner faces of the tool-holders 1 1 are provided with sockets for holding the heading-tools 2 3, the latter of which is provided with a rib for forming the slot or nick in the head of the screw. These sockets are so formed that their axes are in a line which radiates from the axis on which the ram swings up and down. These heading-tools are clamped within the tool-holders by means of the clamp-bolt 4. (See Figs. 10 and 11.) This bolt stands in a hole by the side of the socket which receives the holders 1 1, and one side of the bolt is partially cut away, so as to conform

substantially to the shape of the socket in the ram, as shown in Fig. 11, thereby forming its lower end practically into a wedge. This clamping-bolt is forced upon one of the tool-holders 1 1 by means of the nut 5 at its upper end, the turning of which will draw the clamp-bolt upward to force the tool-holders together, or let it downward to release them. This manner of holding the heading-tools permits the tool-holders to be revolved for bringing the heading-tools 2 and 3 into any desired position.

The ram S is provided with trunnions 6 6, Figs. 10 and 11, which trunnions have their bearings in slides 7 7, Fig. 8, and these slides travel longitudinally in ways formed in the vertical member of angle-plates 8 8, which are adjustably secured to the framing of the machine, as shown in Fig. 8. Bolts 9 pass through lateral slots in the angle-plates 8 8, so that when these bolts are loosened, said plates, together with the ram, may be adjusted laterally upon the machine. This lateral adjustment is effected by means of the set-screws 10 10. It will readily be seen that these adjustments of the tool-holders will enable me to universally adjust the heading-tools. These tool-holders 1 1 abut against the straight side of a wedge, 11, Figs. 3 and 10, which wedge is adjustable by means of the bolt and nut 12, for regulating the lengthwise adjustment of the heading-tools.

The ram S is reciprocated by means of an eccentric or crank on the main shaft B, the pitman 13, and the toggle-arms 14, the throw of the eccentric being great enough to carry the toggle-arms beyond their point of alignment, so that the header may move backward after its forward stroke and then be forced forward again upon the return-stroke of the pitman, this being the ordinary mode of operating a double stroke header; but my ram-operating mechanism differs from the old construction by having the axis of the crank-shaft parallel to the stroke of the ram. In order to accommodate the side motion of the pitman 13, (the motion which is transversely to the length of the crank-shaft B,) I form the outer ends of the toggle-arms ball-shaped, so that they may turn within their sockets, in addition to their movement up and down. The upper end of the pitman 13 also moves forward a little with the stroke of the ram, and therefore said pitman is jointed at or near the lower end, as by the bolt 43, Figs. 2 and 3. I provide my swinging ram with a downwardly-extending arm, 15, to the lower end of which a pair of springs, 16 16, are attached for pulling the ram toward the toggle-arms, and at the same time pulling the forward end of the ram downward. One of these springs is shown in Fig. 2 and the other in Fig. 3. The ram is turned on its trunnions to bring it into three different positions, the most elevated position of the ram being represented in Fig. 3. The header is thrown upward into two of these positions and permitted to fall into the third position by means of the cam 17 and angle-lever 18, the upper outer end of which carries friction-rollers 19 19, as shown in Figs. 3 and 8. The lower end of this lever is jointed and provided with a set-screw, 20, Figs. 2 and 3, by means of which the lever may be adjusted to carry the friction-rollers underneath the header S to any desired height. The springs 16 16 keep the ram pressed downward. It rests upon the friction-rollers 19, excepting when the lever 18 is opposite the lowest point of the cam 17. The lowermost position of the ram S is adjusted to the proper height by means of a laterally-projecting arm, 21, on the ram, the end of which arm bears a set-screw, 22, whose lower end comes in contact with one of the slides 7 7, said slide acting as a stop for limiting the downward swinging movement of the ram, and, in connection with springs 16 16, holds said ram in position, so that it moves forward in a right line the same as if it did not swing; so, also, when the ram is in its intermediate position and rests upon the rollers 19, the under face of said ram, which rests upon said rollers, is so formed as to then be horizontal, and therefore the ram moves forward in a right line. The toggle-arm, which is pivoted or jointed to the ram for driving it forward, is so pivoted thereto that the center of motion of said joint is in the axial line of the trunnions 6 6 of the ram, whereby the force upon the ram to drive it forward is always brought to bear upon the axis of the ram and in a direct line with the punches which radiate from said axis.

It should be noticed that by attaching the springs 16 for pulling the ram downward and backward to an arm, 15, at a point below the axis of said swinging ram, the power of the springs is more nearly equalized—that is to say, when the ram is in its most elevated position the lower end of the arm 15 is thereby carried forward relatively to the axis of said ram; but at this time the ram is drawn backward, so that the springs pull with about the same tension that they do when the front end of the ram is lower down and farther forward.

The wire being gripped by the holding-dies d' d^2, when the end is projected a proper distance for leaving the requisite stock for forming the head, the lever 18 comes opposite the lowest point of the cam 17 and the ram falls to its lowermost position, with the end of the set-screw 22 resting upon the upper face of one slide, 7. The pitman 13 is raised by the action of the crank or eccentric on the shaft B, and the toggle-arms 14 14 are straightened or brought into alignment, thereby forcing the ram forward and bringing the heading-tool 2 against the end of the wire to form a preliminary head, which is substantially a finished head, less the slot. The continued movement of the pitman 13 carries the toggle-arms 14 14 upward above the point of alignment, so that the springs 16 16 withdraw the ram. The cam 17 then presents its middle or intermediate face to the lower end of lever 18, so that the ram rises far enough to bring the heading-tool

3 into alignment with the wire. The pitman 13 then descends and straightens the toggle-arms and forces the heading-tool 3 against the wire, thereby completing the head by forming the slot or nick therein. The further downward movement of the pitman draws the toggle-arms out of alignment and permits the springs 16 16 to draw the ram backward, Meantime the cam 17 presents its highest face to the lower end of the lever 18 and lifts the ram into the position shown in Fig. 3, in which it will be noticed that the middle portion of the ram immediately under the tool-holders 1 1 is removed, so that the wire may be fed forward underneath the heading-tools, to permit a long screw to be fed forward while the ram is thus raised out of its way. The feed operates to advance the stock the proper length when the header is thus raised. The cam 23, carrying two opposite projections, then strikes the lower ends of the cutting-off levers 24 24, bearing cutting and pointing tools 25, which cut off and point the wire at the proper point to leave the requisite amount of metal projecting through the holding-dies to form the head of the succeeding screw.

The knock-out 26 is hung in one end of the lever 27, pivoted to the frame and connected with springs 28 28, which have a tendency to pull the knock-out 26 downward. The opposite end of this knock-out lever 27 has pivoted to it a hooked bar, 29, whose lower end engages with the cam or notched disk 30. (Shown most clearly in Figs. 3 and 3ª.) Immediately after the cutting-dies open the notch in the cam 30 comes opposite the point of the hooked bar 29 and permits said bar to rise, and also permits the springs 28 to force the knock-out 26 downward with a rapid stroke to force the cut-off screw out of the cutting and pointing dies, in case it should have any tendency to stick therein. The slanting side of the cam 30 engages the pointed end of the hooked bar 29 and draws it downward again, thereby raising the knock-out 26 out of the way and holding it thus elevated until the notch in the cam again comes opposite the point of the hooked bar.

31 designates a guard, which takes over the lower end of the hooked bar to prevent it from moving away from the cam 30.

The cutting and pointing dies 25, one of which is shown in Fig. 16, are the same as have been heretofore used in nail-machines for forming what has been termed the "cut-point." They cut off the wire transversely, shave chips from its sides, and swage the point into the desired form. The manner of holding these dies within the upper ends of the levers 24 24 is most clearly shown in Fig. 7. They are adjusted toward each other by means of set-screws 32 32, while they are held in place by clamp-plates, which also form stops 33 for preventing the cutting-edge of the dies 25 from being injured by contact with each other.

By reference to Fig. 7 it will be seen that the clamping and stop plates 33 rest against each other at one edge, while their outer edges bear against shoulders formed in the upper end of the levers 24 24. When these plates are thus brought firmly together the dies 25 25 are adjusted by means of the set-screws 32 32, so that their cutting-edges cannot quite meet, and thereby I insure said cutting-edges against injury by being forced against each other. The levers 24 24 are pivoted on a common center by means of fractional trunnions 34, (see Figs. 3, 4, and 9,) and they are adjustable lengthwise of the machine by means of set-screws 35, whereby they may be made to cut off the wire, with a greater or less portion projecting from the holding-dies.

The cutting and pointing dies, as before stated, are forced together by the cam 23 acting against the lower end of the levers 24 24. These dies are opened under the action of the spring 36, Fig. 4. By the arrangement of cutter-levers 24 24 upon a common center the cutters act upon the wire on a line common to each, and avoid the angular drawing action which takes place when the levers are hung upon separate centers.

In Fig. 15 I have illustrated a revolving straightener as applied to the spindle J of the threader. This addition only requires boring out the small end of the spindle J and inserting the bushings 37 38 therein, while between said bushings there is a radially-adjustable block, 39, which can be forced inward to the desired point by means of the set-screw 40 passing through the body of the pinion F. This addition of the rotary straightener can be made without in any manner changing the construction of the other parts, as hereinbefore described, said rotary straightener being revolved by the pinion L and with the threader.

In order to move the threader-carriage by a positive motion in both directions, instead of pushing it backward by the feeding-carriage against the spring R, it may be actuated by a lever that is operated by a leading cam on the main shaft B, as shown in Figs. 17 and 18. This lever might be operated by a special cam of its own; but the feed-cam G is a proper one for operating said lever. This cam can be made to operate both the feed-carriage and the threader in the following manner: An upright, 45, is formed on or secured to one of the plates *d*, and to the upper end of this upright the lever 46 is pivoted. This lever extends down through an opening at one side of the threader-frame I, as shown in Fig. 17. The lower end of this lever is provided with a longitudinal groove having dovetailed or overhanging side walls, and a like groove is formed in the upper end of the lever E. This latter groove in the lever E is formed in the side which is directly opposite the groove *k*, Figs. 2 and 3.

The levers E and 46 are connected together by means of the adjustable link 47, said link being held in place and adjusted by means of bolts, whose heads fit the grooves in said levers in the same manner as the link H is se-

cured to and adjusted upon the levers E F. By means of these levers and adjustable links the feed-carriage and the threader-frame may be moved both ways by a positive motion under the influence of the cam G, and at the same time their relative movement may be adjusted as may be desired. Inasmuch as I leave a plain or unthreaded portion of the wire for forming the head, the movement of the threader-carriage is always less than that of the feed-carriage. In many cases the threader-carriage moves only about half the distance of the feed-carriage. Either of the two modes herein described for moving the threader-carriage may be employed, as may be desired, while the other parts of the machine are the same as first described.

By adjusting the set-screw *b'* on the lever *s* so that the threading rollers *l* will not be forced with pressure against the wire, the machine may be used for making wire nails. Of course for such use parts of the threader, or even the whole threader, may be removed from the machine; but letting the threading-rollers out of action is all that is necessary in order to make threadless nails.

I am aware that a prior English patent for a machine for heading bolts, rivets, and screws shows a swinging ram having heading-tools, both of which radiate from the center on which the ram swings, and mechanism for elevating said ram to different heights; also, that a prior patent for a machine for heading bolts shows a pair of toggle-arms with a heading-ram formed rigidly on the end of one of said arms, a crank-shaft whose axis is parallel to the guides between which the ram reciprocates, and a pitman connected at one end to the common joint of the toggle in a manner to allow universal motion for said pitman, and having also a joint near its crank end; also, that another prior patent for wood-screw machines shows a header having two heading-tools adapted to act successively, the last tool to act on the head having a central conical teat to form a conical depression in the center of the screw-head. All of said prior art is hereby disclaimed.

I claim as my invention—

1. The mechanism for reciprocating the feed, which consists of the combination of the feed-cam G, the grooved levers E and F, pivoted to the framing, one below and the other above said cam, and the adjustable connecting-link H, substantially as described, and for the purpose specified.

2. The mechanism for reciprocating the threader, which consists of the combination of the lever 46, pivoted to the framing, the lever E, which actuates the feed-slide *c*, mechanism for reciprocating said lever E, and the adjustable link 47, for connecting said levers E and 46, substantially as described, and for the purpose specified.

3. In a machine for making screws, the combination of mechanism for feeding the wire intermittently, the reciprocating threader-carriage, the lever pivoted to the framing of the machine for operating said carriage, the leading cam, and mechanism operatively connecting said cam and lever, whereby the threader-carriage has imparted to it a positive motion in both of its movements, substantially as described.

4. In a machine for making screws, the combination of the rotary spindle, having also a reciprocating movement, the radially-moving threading-rollers *l*, and mechanism for forcing said rollers into action upon the wire, and then releasing their hold thereon at each reciprocation of the spindle, substantially as described, and for the purpose specified.

5. In a machine for making screws, the combination of the spindle J, the rollers *l*, mounted in radially-moving slides in the head of said spindle, the sleeve *q*, and mechanism for forcing said sleeve over the radially-moving slides, substantially as described, and for the purpose specified.

6. In a machine for making screws, the combination of the threader-frame, the spindle mounted within said frame, the threading-rollers mounted in radially-moving slides in the head of said spindle, the sleeve *q*, the forked pin *r*, connected with said sleeve and passing through an oblique slot in the threader-frame, and mechanism for moving said pin within said slot, substantially as described, and for the purpose specified.

7. In a machine for making screws, the combination of a reciprocating threader having radially-moving threading-rollers *l* and forked trip-pin *r*, the lever *s*, having the end which engages said forked pin widened in the longitudinal direction of the machine to correspond with the longitudinal movement of the threader, and mechanism for moving said lever laterally, substantially as described, and for the purpose specified.

8. In a machine for making screws, the combination of the threading-rollers mounted in radially-moving slides, the sleeve *q*, mechanism for forcing said sleeve over said slides, and mechanism for adjusting the throw of said sleeve to regulate the depth of thread formed by said rollers, substantially as described.

9. In a machine for making screws, the combination of mechanism for feeding the wire intermittently, a reciprocating threader-carriage, and rotary threader mounted on said carriage, substantially as described, and for the purpose specified.

10. In a machine for making screws, the reciprocating threader-carriage, the rotary threader mounted on said carriage, and means for bringing said threader into action on the wire during a part of each reciprocation, substantially as described, and for the purpose specified.

11. In a machine for making screws, the combination of the rotary threader and a rotary wire-straightener formed in the spindle of said threader, substantially as described, and for the purpose specified.

12. In a machine for making screws, the combination of the rotary threader, the lever *s*, for forcing the threader into action upon the wire, the cam P, acting on the lever Q, for closing the gripping-dies, and mechanism for operatively connecting the levers *s* and Q, whereby said levers are operated by the cam P, substantially as described, and for the purpose specified.

13. In a machine for heading screws or nails, the combination of the ram having a cylindrical bore, the semicircular tool-holders 1 1 fitted therein and having sockets for the heading-tools, and the clamp-bolt 4, or its equivalent, for securing said tool-holders in place when turned axially to any desired position within said cylindrical bore, substantially as described, and for the purpose specified.

14. In a machine for heading screws or nails, the combination of the ram having a cylindrical bore, the tool-holders 1 1 fitted therein and having sockets for the heading-tools, mechanism for holding said tool-holders in place, and means for adjusting the ram laterally, substantially as described, and for the purpose specified.

15. In a machine for heading screws or nails, the combination of the ram having trunnions 6 6, the slides 7 7, within which said trunnions are mounted, the caps 8 8, within which the ways for said slides are formed, and set-screws 10 10, for adjusting said parts laterally, the caps being secured to the frame of the machine by holding-screws 9 9, substantially as described, and for the purpose specified.

16. In a machine for heading screws or nails, the combination of a swinging ram having heading-tools, both of which radiate from the center on which said ram swings, mechanism for raising and lowering said ram, and the arm 21, projecting laterally from the ram and acting on a stop, having a horizontal surface to guide the ram in a right line when it is allowed to fall into its lowermost position, substantially as described, and for the purpose specified.

17. In a machine for heading screws or nails, the combination of a swinging ram having trunnions 6 6, the slides 7 7, moving in ways and carrying the trunnions of the ram, and mechanism for reciprocating said ram and slides, substantially as described, and for the purpose specified.

18. In a machine for heading screws or nails, the combination of the swinging ram mounted in slides, mechanism for reciprocating said ram, and two separate rests for the forward end of the slide acting alternately to hold the ram at different heights and to guide it in a right line during the forward stroke of said ram by surfaces which are parallel to said stroke, substantially as described, and for the purpose specified.

19. In a machine for heading screws or nails, the combination of the ram, the angle-lever 18, and the cam 17, mounted on shaft B and having three faces opposed to the end of said angle-lever, substantially as described, and for the purpose specified.

20. In a machine for heading screws or nails, the swinging ram having the arm 15, with its lower end below the plane in which lies the axis of said ram, the springs or spring 16, connected to the framing or stationary support at one end, while the opposite end of said spring is connected to arm 15, and mechanism for reciprocating and elevating said ram, substantially as described, and for the purpose specified.

21. In a machine for heading screws or nails, the combination of the framing, a ram adapted to move forward in a right line, the toggle-arms 14 14, having their outer ends, respectively, pivoted to said framing and ram by ball-and-socket joints, and mechanism for operating said toggle-arms, substantially as described, and for the purpose specified.

22. In a machine for heading screws or nails, the combination of a swinging ram mounted in slides, the crank-shaft with its axis parallel to the reciprocating movement of said ram, mechanism for operatively connecting said crank-shaft and ram, the lever for raising said ram, and the cam on said crank-shaft for operating said lever, substantially as described, and for the purpose specified.

23. In a nail or screw machine, the cutting-off levers 24 24, mounted within the framing on a common center, substantially as described, and for the purpose specified.

24. In a nail or screw machine, the combination of the levers 24, the dies 25, the stop-plates 33, and means for adjusting said dies relatively to the meeting-point of said stop-plates, substantially as described, and for the purpose specified.

25. The combination of the gripping-dies, the rotary theader having its axis in alignment with the space between said gripping-jaws, whereby the wire may pass from the threader into the gripping-dies, and mechanism for operating said threader and dies, substantially as described, and for the purpose specified.

26. The combination of a threader, the gripping-dies, the heading-ram, and mechanism for operating said parts, substantially as described, and for the purpose specified.

27. The combination of a threader, the gripping-dies, the heading-ram, the cutting-off dies, and mechanism for operating said parts, substantially as described, and for the purpose specified.

28. In a machine for heading screws or nails, the heading-tools 2 and 3, adapted to act successively, while the last one of the tools to act on each screw-head is provided with a slot-forming rib, substantially as described, and for the purpose specified.

29. The combination of mechanism for feeding the wire of indefinite length, a threader-carriage, mechanism for giving a reciprocating movement to said threader-carriage, and threading-tools having a radial movement toward and from the axis of the wire and

adapted to alternately act upon the wire to form a thread and to be released from their action, substantially as described, and for the purpose specified.

30. The combination of a ram having trunnions upon which it swings and a toggle-arm or pitman pivoted or jointed to said ram for moving it forward, said pivot or joint being formed in axial line with the trunnions on which said ram swings, substantially as described, and for the purpose specified.

HORACE K. JONES.

Witnesses:
THOS. S. BISHOP,
M. S. WIARD.